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Medium-sized and large mammals of the Cazumbá-Iracema Extractivist Reserve, Acre, Brazil

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Abstract
The medium-sized and large mammals of the Cazumbá-Iracema Extractivist Reserve, Acre, Brazil are inventoried. Data were collected using five methods: line transects, opportunistic sightings, camera trapping, hunting calendar, and hunting interviews. In total, 52 species belonging to 27 families were recorded; 11 species are threatened. We discuss the factors, such as hunting, that affect the occurrence of these species. In addition, we document the food taboos for *Priodontes maximus* (Kerr, 1792) and *Dinomys branickii* Peters, 1873, two threatened species. The confirmed occurrence of threatened species in the Cazumbá-Iracema Extractivist Reserve makes long-term studies necessary to obtain essential information for the understanding the viability of these populations.

Keywords
Camera-trapping, hunting calendar, interviews, line transect, protected area, species richness.

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Introduction

The Neotropical mammalian fauna is the most diverse in the world, with Brazil considered the country with the greatest species richness worldwide (Costa et al. 2005). Percequillo et al. (2017) indicated the occurrence of 775 mammalian species in Brazil, within which the Amazonian biome is the most species rich, with approximately 399 species of mammals. Of this number, 231 species (57.8%) are endemic to this biome (Paglia et al. 2012). Patterson and Costa (2012) pointed out that factors, such as diverse vegetation types, climate, and geological history of South America, are directly associated with this species richness.

Mammals are important for maintaining ecological processes, such as seed dispersal (Acevedo-Quintero and Zamora-Abrego 2016), removal of fruits and seedlings (Miguel et al. 2017), pollination (Regan et al. 2015), and consequently, the structuring of tropical forests (Wright 2003; Haugaasen et al. 2010). In addition to ecological aspects, they represent an important source of protein (Redford and Robinson 1987; Peres 2000; Fernandes-Ferreira 2011) and income (Levi et al. 2011) for traditional populations of humans. However, even in view of their ecological and ecnomico-social importance, there are still gaps regarding the geographical distribution, species richness, and human use of mammals (Fonseca and Venticinque 2018).

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Studies of mammalian species richness in the Brazilian Amazon are concentrated in the central and northern Amazon (Costa et al. 2005; Bernard et al. 2011; Mendes-Oliveira and Miranda 2015). Estimates indicate that 40% of the mammal species from Brazil may occur in the western Amazon, where the state of Acre is located (Acre 2010). The number of mammalian species in Acre is estimated at 203, which represents 29% of the total number of mammals that occur in Brazil (SEMA 2010). Mammal inventories carried out in Acre include surveys of medium-sized and large terrestrial taxa (Calouro 1999; Botelho et al. 2012; Borges et al. 2015), bats (Taddei et al. 1990; Nogueira et al. 1999; Calouro et al. 2010), rodents, and marsupials (Patton et al. 2000; Abreu-Júnior et al. 2016), but no study has focused on aquatic mammals.

In view of the extensive knowledge gaps, this study reports an inventory of medium-sized and large mammalian species in the Cazumbá-Iracema Extractivist Reserve (CIER). The CIER (750,000 ha) is located in northwestern Brazil (center at 09°08′S, 068°56′W) in the basin of the Purus River and is within the municipalities of Sena Madureira and Manoel Urbano, state of Acre. The CIER, which was established in 2002, is divided into five macroregions—Cazumbá, High Caeté, Middle Caeté, Riozinho-Cachoeira, and Jacareúba-Redenção—in addition to an integral protected area.

Methods

Our study was conducted in the macroregion of Cazumbá (09°07.46′S, 068°57.08′W), (Fig. 1) which has the highest human population density in the CIER (Brasil 2007). The main source of income generation for these populations comes from the sale of cassava flour, followed by cattle ranching, corn and rice plantations, rubber tapping, and Brazil nut collecting. The predominant vegetation is open moist forest mixed with bamboo (Brasil 2007).

For our survey of medium-sized and large mammals, we employed the following methods: line transects, opportunistic sightings, camera trapping, hunting calendar, and interviews. The line transect methodology was the main method employed, while the others were used to complement the list of species. All residents who participated in the study were given a guarantee of anonymity regarding the information provided and were free to quit the study at any moment. This study was authorized by the System of Authorization and Information about Biodiversity (SISBIO) under the number 25701. The study was carried out from January 2011 to January 2012. No biological material was collected.

Two transect sites were defined by using the human population density in the CIER as a criterion to record as many species as possible. The two sites were 18 km apart, and at each site, two transects each 4 km long and 1.5 km apart were established. The method used was that of Burnhan et al. (1980) and Buckland et al. (1993), wherein two surveyors made observations along a transect while walking at the standard speed of 1.5 km/h. This method is best done between 06:00 h and 12:00 h (NCR 1981). Each transect was sampled monthly during the study, for an average of 15 days (10–20 days) of monthly effort and totaling 956.65 km traveled.

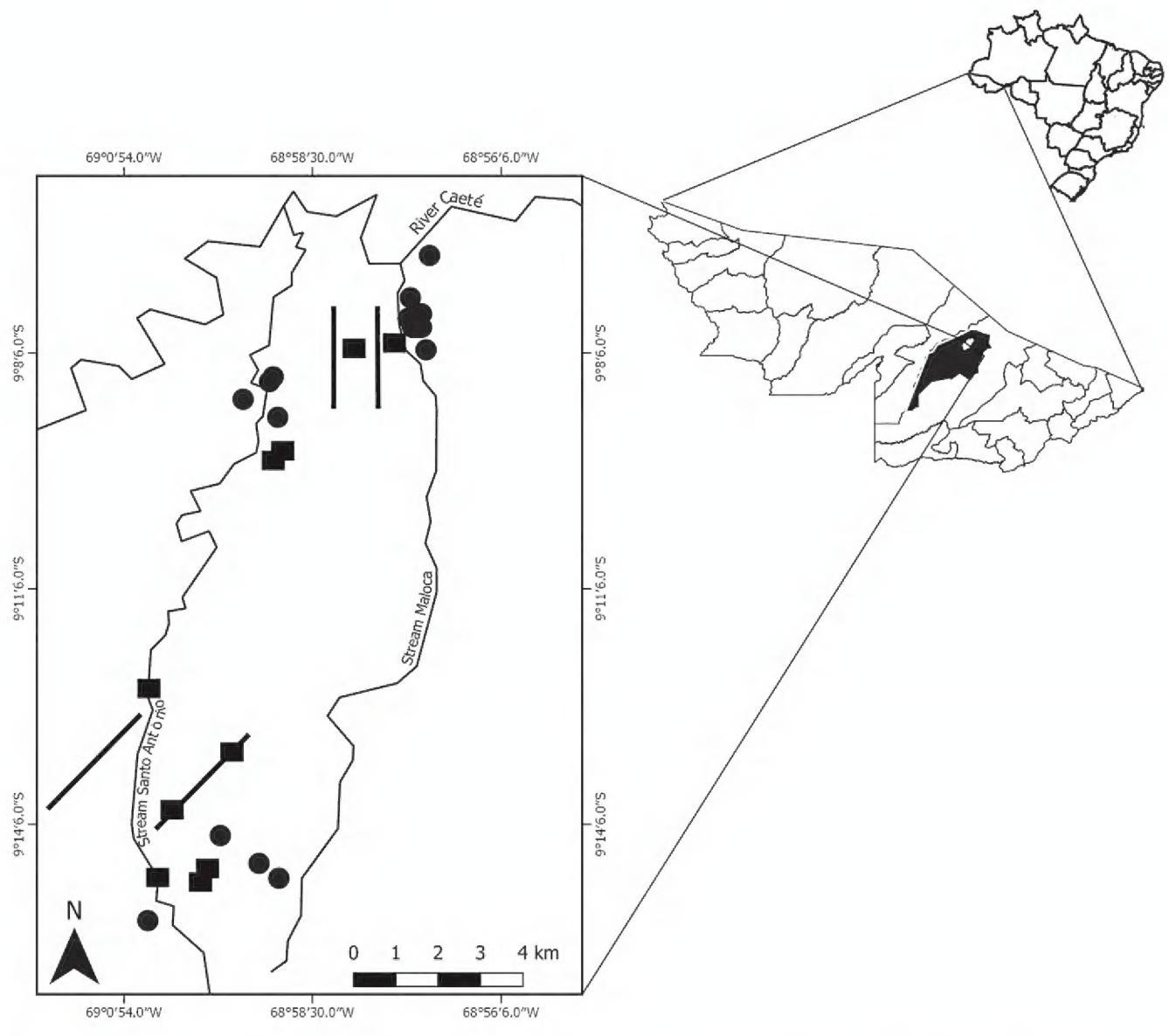

Figure 1. Cazumbá-Iracema Extractivist Reserve study site, sampling design and human settlements. Lines represent the line transects, squares represent the camera-trapping, and dots represent the human settlements.

Tracks and direct sightings were recorded opportunistically on the banks of streams and rivers and, in the case of the trails, during the application of the line transect method. Osteological material was also collected, which was composed of animal skulls that were identified by comparisons with photographs of material deposited in the collection of the Laboratório de Ecologia de Mamíferos of the Federal University of Acre.

Semi-structured interviews were carried out to assess the presence of mammalian species in the CIER (Albuquerque et al. 2010). The interviews were preliminarily focused on the application of the hunting calendar (see below) to record the hunted species that occur there. This methodology is widely used in hunting studies (El Bizri et al. 2016; Lemos et al. 2018; Oliveira and Calouro 2019). During the interviews, the hunters were asked to list the species sighted and use photographs to validate the record of other species that were not previously listed. Additionally, illustrations of exotic species (e.g. gorillas, golden lion tamarin, and lion) were made available to validate the information. To choose which hunters to interview, informal conversations were held with local people to indicate individuals with recognized experience in hunting and animal recognition (Davis and Wagner 2003). In total, 33 hunters were interviewed.

For the hunting record, the hunting calendar method was used, in which each sheet corresponds to one month. Each page was composed of boards of the target or potential animals hunted in the CIER. Below the image of each animal, there was a table, where every time an animal was sacrificed, a cell would be filled. A cell labeled "Other" was inserted to encompass animals that did not occur on the calendar. A supplementary questionnaire was used to collect information on the animals marked in the calendar (Oliveira et al. 2018). As it is possible to have more than one hunter in a house, the hunting calendar was treated as a sampling unit. Overall, 24 hunting calendars were distributed, and the sampling lasted for seven months.

Camera traps were also used to record species with cryptic habits (those that are difficult to spot and/or are nocturnal). Camera traps were allocated to locally known community hunting sites, such as salt licks, fruiting trees, and borders of water bodies, and routes used frequently by animals. The camera trap allocation was not systematically designed. At each sampling point, a single trap was installed, which remained on the site for an average of 10 consecutive days. Five traps (Bushnell Model ZT820) were used, and each trap had 48 days of exposure.

Species were identified according to Oliveira and Cassaro (1997), Emmons (1997), Becker and Dalponte (1999), Eisenberg and Redford (1999), Wilson and Reeder (2005), and Carvalho and Luz (2008). For methods using photographs, those present in Emmons (1997) and Eisenberg and Redford (1999) were used.

For taxonomic identification, we followed the methods of Bonvicino et al. (2008) and Gardner (2008) for rodents and marsupials; Mittermeier et al. (2013), Byrne et al. (2016), Rylands et al. (2016), and Garbino et al. (2019) for primates; Kitchener et al. (2017) for felids; Emmons (1997) and Miranda et al. (2017) for anteaters; Feijó and Cordeiro-Estrela (2016) for armadillos; and Eisenberg and Redford (1999) for the remaining mammals. The conservation status of each species was obtained from the list maintained by the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio), Ministry of the Environment (ICMBio 2018) and the international lists from the International Union for the Conservation of Nature (IUCN 2018) and Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 2017).

Results

In total, 52 species belonging to nine orders and 28 families were recorded (Table 1). *Aotus nigriceps* (Dollman, 1909), *Plecturocebus toppini* (Thomas, 1914), *Coendou prehensilis* (Linnaeus, 1758), *Notoscirus pucheranii* (Gray, 1867), and *Hadrosciurus spadiceus* (Olfers, 1818) (the last two previously recorded as *Sciurus* spp.), which were previously identified only to genus (Brasil 2007) and were identified to species.

From the line transect method, 27 species were recorded, including the documentation of a species exclusively using this method (Table 2). Of the complementary methods used, the interviews recorded 47 species and seven exclusive species. A comparison of the species richness in our study with that of other sample sites in Acre is presented in Table 2. Of the 52 species recorded, 11 are cited in at least one of the main lists of threatened species, such as *Tamandua tetradactyla, Panthera onca,* and *Ateles chamek*.

Diagnostic characterization of rare or cryptic species are provided here in phylogenetic order. Species recorded by the camera traps are shown in Figure 2.

Identification

Order Pilosa
Family Myrmecophagidae

***Myrmecophaga tridactyla* Linnaeus, 1758**, Giant Anteater

Records. Recorded by line transect (09°08.946′S, 068° 55.516′W) and hunting interviews.

Identification. The fur is dense and dark gray and black. The forelegs are white with black bands on the toes and with a white stripe oriented diagonally towards the body. The tail is large, with long, thickfur (Gaudin et al. 2018).

Order Cingulata
Family Dasypodidae

***Dasypus pastasae* (Thomas, 1901)**, Greater Long-nosed Armadillo
Figure 2A

Records. Recorded by hunting calendar (09°15.898′S, 068°58.372′W) and opportunistic sightings.

Identification. The dark brown carapace, with yellow edges, presents 10–13 moveable bands, which are not well separated. The head has more than 50 plates, which are irregularly distributed. The tail is not entirely covered with dermal plates, which are few in number and sparsely distributed (Hayssen 2014).

Table 1. Mammals of the Cazumbá-Iracema Extractivist Reserve, state of Acre, Brazil. Methods used in the research: Lt = line transect; Ct = camera trap; Os = opportunistic sightings; O = osteological material; I = interviews; Hc = hunting calendar. List of threatened: EN = endangered; VU = vulnerable; I = First Appendix Cites.

Order	Family	Scientific Name	Vernacular name	Methods	IUCN	CITES	MMA
Didelphimorphia	Didelphidae	*Didelphis marsupialis* Linnaeus, 1758	Common Opossum	I/Ct	LC	—	—
		Metachirus nudicaudatus (É. Geoffroy, 1803)	Brown four-eyed opossum	Os	LC	—	—
Pilosa	Bradypodidae	*Bradypus variegatus* Schinz, 1825	Three-toed Sloth	I/Os	LC	II	—
	Megalonychidae	*Choloepus didactylus* (Linnaeus, 1758)	Two-toed Sloth	I/Lt	LC	—	—
	Cyclopedidae	*Cyclopes ida* Thomas 1900	Silky Anteater	I	LC	—	—
	Myrmecophagidae	*Myrmecophaga tridactyla* Linnaeus, 1758	Giant Anteater	Lt/I	VU	II	VU
		Tamandua tetradactyla (Linnaeus, 1758)	Tamandua	I/Lt	LC	—	—
Cingulata	Dasypodidae	*Dasypus novemcinctus* Linnaeus, 1758	Nine-banded Armadillo	Hc/Os/O	LC	—	—
		Dasypus pastasae (Thomas, 1901)	Greater Long-nosed Armadillo	Hc/Os/Ct	—	—	—
	Chlamyphoridae	*Priodontes maximus* (Kerr, 1792)	Giant Armadillo	I/Os	VU	I	VU
		Cabassous unicinctus (Linnaeus, 1758)	Southern Naked-tailed Armadillo	Hc/Os	LC	—	—
Perissodactyla	Tapiridae	*Tapirus terrestris* (Linnaeus, 1758)	Tapir	Hc/Os/I/Ct	VU	II	VU
Cetartiodactyla	Cervidae	*Mazama americana* (Erxleben, 1777)	Red Brocket Deer	Lt/Hc/Os/Ct/I	DD	—	—
	Tayassuidae	*Tayassu pecari* (Link, 1795)	White-lipped Peccary	I	VU	II	VU
		Pecari tajacu (Linnaeus, 1758)	Collared Peccary	Lt/Hc/Os/Ct/I	LC	II	—
	Iniidae	*Inia geoffrensis* (Blainville, 1817)	Boto	I/Os	EN	—	EN
	Delphinidae	*Sotalia fluviatilis* (Gervais & Deville, 1853)	Tucuxi	I/Os	DD	—	—
Primates	Callitrichidae	*Callimico goeldii* (Thomas, 1904)	Goeldi's Monkey	Lt/I	VU	I	—
		Cebuella niveiventris Lönnberg, 1940	Dwarf Marmoset	Lt/I	LC	II	—
		Leontocebus weddelli (Spix, 1823)	Weddell's Saddle-backed Tamarin	Lt/I	LC	II	—
		Saguinus imperator (Goeldi, 1907)	Emperor Tamarin	I/Os	LC	II	—
	Aotidae	*Aotus nigriceps* Dollman, 1909	Black-headed Night Monkey	Lt/Hc/I	LC	II	—
	Cebidae	*Saimiri boliviensis* (I. Geoffroy & de Blainville, 1834)	Bolivian squirrel monkey	Lt/I	LC	II	—
		Cebus unicolor (Spix, 1823)	White-fronted Capuchin	Lt/Hc/I/Ct	LC	I	—
		Sapajus macrocephalus (Spix, 1823)	Robust Capuchin	Lt/Hc/I	LC	II	—
	Pitheciidae	*Plecturocebus toppini* (Thomas, 1914)	Titi Monkey	Lt/Hc/I	LC	II	—
	Atelidae	*Alouatta puruensis* Lönnberg, 1941	Howler Monkey	Lt/Hc/I/Ct	LC	II	—
		Ateles chamek (Humboldt 1812)	Spider Monkey	I/O	VU	II	VU
Carnivora	Canidae	*Atelocynus microtis* (Sclater, 1883)	Small-eared Dog	I	NT	—	VU
		*Speothos venaticus (*Lund, 1842)	Bushdog	I	VU	I	VU
	Felidae	*Leopardus wiedii* (Schinz, 1821)	Margay	Lt/I/Os	NT	I	VU
		Leopardus pardalis (Linnaeus, 1758)	Ocelot	Lt/Hc/I/Ct	VU	I	—
		Herpailurus yagouaroundi (I. Geoffory & Saint-Hilare, 1803)	Jagarundi	I	LC	II	VU
		Puma concolor (Linnaeus, 1771)	Puma	I/Os	LC	—	VU
		Panthera onca (Linnaeus, 1758)	Jaguar	Lt/I/Os	NT	I	VU
	Mustelidae	*Eira barbara* (Linnaeus, 1758)	Tayra	Lt/I	LC	—	—
		Lontra longicaudis (Olfers, 1818)	Southern River Otter	I	NT	I	—
		Pteronura brasiliensis (Zimmermann, 1780)	Giant Otter	I	EN	I	VU
	Procyonidae	*Nasua nasua* (Linnaeus, 1766)	South American Coati	Lt/Hc/I	LC	—	—
		Bassaricyon alleni Thomas, 1880	Eastern Lowland Olingo	I/Os	LC	—	—
		Potos flavus (Scheber, 1774)	Kinkajou	Lt/I	LC	—	—
		Procyon cancrivorus (G. [Baron] Cuvier, 1798)	Crab-eating Racoon	Lt/I/Ct	LC	—	—
Rodentia	Sciuridae	*Notosciurus pucheranii* (Gray, 1867)	Variable Squirrel	Lt/I/Ct	DD	—	—
		Hadrosciurus spadiceus Olfers, 1818	Southern Amazon Red Squirrel	Lt/Hc/Ct/I	LC	—	—
	Erethizontidae	*Coendou prehensilis* (Linnaeus, 1758)	Brazilian Porcupine	Lt/I/Ct	LC	—	—
	Dinomyidae	*Dinomys branickii* Peters, 1873	Pacarana	I/Os	LC	—	—
	Caviidae	*Hydrochoerus hydrochaeris* (Linnaeus, 1766)	Capibara	I/Os/O	LC	—	—
	Dasyproctidae	*Dasyprocta fuliginosa* Wagler, 1832	Agouti	Lt/Hc/Os/Ct/I	LC	—	—
		Myoprocta pratti Pocock, 1913	Agouchi	Lt/Hc/Os/Ct/I	LC	—	—
	Cuniculidae	*Cuniculus paca* (Linnaeus, 1758)	Paca	Lt/Hc/Os/Ct/I	LC	—	—
	Echimyidae	*Dactylomys dactylinus* (Desmarest, 1817)	Bamboo Rat	Lt	LC	—	—
Lagomorpha	Leporidae	*Sylvilagus brasiliensis* (Linnaeus, 1758)	Tapiti	I/O	NT	—	—

Table 2. Number of species recorded per method employed.

Methods	Total	Exclusive	Exclusive species
Line transect	28	1	*Dactylomys dactylinus*
Camera trap	15	0	—
Opportunistic sightings	12	1	*Metachirus nudicaudatus*
Osteological material	3	0	—
Interviews	47	7	*Cyclopes ida*, *Tayassu pecari*, *Atelocynus microtis*, *Speothos venaticus*, *Herpailurus yagouaroundi*, *Lontra longicaudis*, and *Pteronura brasiliensis*
Hunting calendar	17	0	—

Family Chlamyphoridae

***Priodontes maximus* (Kerr, 1792)**, Giant Armadillo

Records. Recorded by opportunistic sightings (09° 07.632′S, 068°06.230′W) and hunting interviews.

Identification. Its carapace is highly flexible, with 11–13 moveable bands. Hair is sparse. The body is dark brown, except for the head and tail and for a light-colored stripe around the edges of the body. The tail is long, narrow, and covered with small pentagonal scales (Carter et al. 2016).

Order Perissodactyla
Family Tapiridae

***Tapirus terrestris* (Linnaeus, 1758)**, Lowland Tapir
Figure 2B

Records. Recorded by hunting calendar (09°15.898′S, 068°58.372′W), opportunistic sightings, hunting interviews, and camera trapping.

Identification. The body is robust and the head is convex due to its prominent sagittal crest. A straight mane extends from the base of the snout to the middle of the dorsum (Padillia and Dowler 1994).

Order Cetartiodactyla
Family Cervidae

***Mazama americana* (Erxleben, 1777)**. Red Brocket
Figure 2C

Records. Recorded by line transect (09°15.898′S, 068° 58.372′W), opportunistic sightings camera trapping, hunter interviews, and hunting calendar.

Identification. The body is predominantly reddish-brown but varies from light to very dark. The neck is brown which contrasts with the color of the trunk. The flanks are similarly paler colored. There are white blotches at the base of the ears (Rossi 2000).

Family Tayassuidae

***Tayassu pecari* (Link, 1795)**, White-lipped Peccary

Record. Recorded by hunting interviews (09°08.306′S, 068°55.899′W).

Identification. The fur of the adults varies from dark brown to black, with lighter bands along the jaw line (Mayers and Wetzel 1987).

Family Iniidae

***Inia geoffrensis* (Blainville, 1817)**, Amazon River Dolphin

Records. Recorded by hunting interviews (09°06.205′S, 068°56.709′W) and opportunistic sightings.

Identification. The body varies from light gray in juveniles to pink in adults. The eyes are small and the rostrum is long and narrow, with the presence of vibrissae. The melon on the head is prominent (Best and Silva 1993).

Order Primates
Family Callitrichidae

***Callimico goeldii* (Thomas, 1904)**, Goeldi's Monkey

Records. Recorded by line transect (09°08.864′S, 068° 55.480′W) and hunting interviews.

Identification. This is a small monkey with a non-prehensile tail. Its fur is coal black. The skin on the lips, snout, rim of the ears, hands, and feet is black (Mittermeier et al. 2013).

Family Atelidae

***Ateles chamek* (Humboldt, 1812)**, Black-faced Black Spider Monkey

Records. Recorded by hunting interviews (09°07.714′S, 068°57.434′W) and osteological material (09°16.510′S, 068°57.432′W).

Identification. The body is darkly colored, with the face devoid of hair and black. The limbs are long and the tail is a prehensile (Emmons 1997).

Order Carnivora
Family Canidae

***Speothos venaticus* (Lund, 1842)**, Bush Dog

Record. Recorded by hunter interviews (09°08.045′S, 068°57.037′W).

Identification. The body is narrow and the ears are small and rounded. The tail, snout, and limbs are short. Its fur is thick and reddish brown, nearly uniform in colour in the dorsum and ventral portions, except for the head fur, which is reddish tan (Beisiegel and Zuercher 2005).

Figure 2. Mammalian species recorded in the Cazumbá-Iracema Extractivist Reserve by camera-trapping. **A.** *Procyon cancrivorus*. **B.** *Leopardus paradalis*. **C.** *Mazama americana*. **D.** *Dasypus pastasae*. **E.** *Coendou prehensilis*. **F.** *Tapirus terrestris*.

Family Felidae

***Leopardus pardalis* (Linnaeus, 1758)**, Ocelot
Figure 2D

Records. Recorded by line transect (09°17.863′S, 068° 58.650′W), camera trapping, hunter interviews, and hunting calendar.

Identification. The head and paws are proportionally large. The coloration varies from pale yellowish-gray to brown with diverse intermediate tonalities. The ventral surface is whitish, and the black blotches tend to form open rosettes in small clusters, forming longitudinal stripes on its flanks (Murray and Gardner 1997).

***Herpailurus yagouaroundi* (É. Geoffory Saint-Hilare, 1803)**, Jaguarundi

Record. Recorded by hunter interviews (09°12.947′S, 068°56.955′W).

Identification. The coloration is distinct, without patches. The head is small, narrow, and flattened, with small, rounded ears. The body is slight and elongated, with a long tail and relatively short legs (Oliveira 1998).

Family Mustelidae

***Pteronura brasiliensis* (Gmelin, 1788)**, Giant Otter

Record. Recorded by hunting interviews (09°08.046′S, 068°57.276′W).

Identification. The fur is short and dark brown, with light patches on the chest and throat. Each individual has the patches in a unique pattern, which allows individuals to be recognized. The feet have interdigital webs. The tail is long and dorsoventrally flattened (Noonan et al. 2017).

Family Procyonidae

***Procyon cancrivorus* (G. [Baron] Cuvier, 1798),** Crab-eating Raccoon
Figure 2E

Records. Recorded by line transect (09°15.898′S, 068° 58.372′W), camera trapping, and hunter interviews.

Identification. The fur is coarse and short. The body coloration varies from dark brown to gray. The species is easily distinguished by the black mask that extends from the eyes to the base of the mandible, the various dark rings on the tail, and the length of the hind limbs (Emmons 1997).

Order Rodentia
Family Erethizontidae

***Coendou prehensilis* (Linnaeus, 1758)**, Brazilian Porcupine
Figure 2F

Records. Recorded by hunter interviews (09°10.241′′S, 068°57.407′W), line transect, and camera trapping.

Identification. The ears are short ears and the eyes large. The fur is composed of a mix of rigid, aculeiform, and fine hair. The fur on the dorsum varies from black to yellowish brown, on the ventral surface from white to gray. The tail is prehensile, with spines in the proximal half and bristles in the distal half. An adult individual can measure 47 cm high (Emmons 1997).

Family Dinomyidae

***Dinomys branickii* Peters, 1873**, Pacarana

Records. Recorded by hunter interviews (09°16.958′S, 068°57.708′W) and opportunistic sightings.

Identification. The body is large and robust, with a massive head. The ears are short and rounded, the limbs short, and the tail thick. The fur is grayish on the head and shoulders but finely dashed and dark brown on the rest of the dorsum, with two or more rows of white circular spots on each longitudinal half of the body, from the shoulder girdle to the base of the tail (White and Alberico 1992).

Discussion

Of the documented species, we were able to confirm 41 species by direct records (camera trapping, sightings, traces, and osteological material). Order Carnivora had the highest number of species identified by an indirect record. Our study presents the highest richness of mammals recorded in a single locality in the state of Acre. Rapid inventory studies that were made for the CIER management plan recorded 45 species in eight orders and 26 families (Brasil 2007). Our study recorded 7 additional species, and confirmed 30 species through direct observations (sightings, camera trapping, and osteological material). Comparatively, of the 45 initially listed species, 36 were recorded indirectly in interviews and by traces. However, in the present study, only eight records were obtained indirectly.

In three comparable studies (Calouro 1999; Botelho et al. 2012; Borges et al. 2015), similar methods were employed, except for the hunting calendar, which was used only by us (Table 3). In our study, the species richness was greater than that observed by Calouro (1999) and Botelho et al. (2015) but similar to that recorded by Borges et al. (2015). The similarity of the species richness in our study and that of Borges et al. (2015) may be because the CIER and Chandless State Park share a common border, are both in the Purus river basin, and have great similarities in their vegetation. CIER and Chandless State Park are part of a mosaic of protected areas, which form a large and legally protected forest block. We emphasize the importance of conducting studies within large forest blocks, due to their importance for the maintenance of biodiversity. Much of the territory in Acre is of extreme or very high biological importance for the conservation of biodiversity (Souza et al. 2003). The CIER is extremely important for the conservation of mammals because it has both high species richness and a high rate of endemic and rare species (Brasil 2001). The importance of the CIER will increase as on bats, rodents, marsupials, and other previously unsampled taxa are inventoried. Our results, in comparison with the previous inventory for the CIER (Brasil 2007), demonstrate the importance of using varied methodologies to better inventory medium-sized and large mammals.

Among the threatened species that were recorded, we particularly highlight the felids due to the potential for conflict situations. Felids are often killed due to their predation of domestic herds (Michalski et al. 2006; Dickman 2010; Marchini and Crawshaw 2015) and for fear of attacks on humans, although no attack has been reported within the limits of the CIER. During our study,

Table 3. Number of species recorded in different protected areas in the state of Acre, Brazil. Methods used in the studies: Lt = Line transect, At = Camera trapping, T = Tracks, I = interview, Hc = Hunting calendar.

Location	Basin	*N*	Methods	Study
Humaiatá Forest Reserve	Acre/Purus	25	Lt/Ct	Botelho et al. 2012
Serra do Divisor National Park	Juruá	43	Lt/T/I	Calouro 1999
Chandless State Park	Purus	51	Lt/Ct/T/I	Borges et al. 2015
Cazumbá-Iracema Extractivist Reserve	Purus	52	Lt/Ct/Hc/I	Present study

three *Leopardus pardalis* were killed, two due to attacks on livestock and one because the animal was near the human habitation. During the interviews, 11 *Panthera onca* individuals were reported to have been hunted in the five years prior to the study. Five kills, including two cubs, were made due to predation on livestock, while the other kills were because animals were close to houses and livestock breeding areas. The number of slaughtered animals can be confirmed by documenting the skins, skulls, and teeth that are commonly exposed as trophies in the houses of hunters.

Tapirus terrestris is targeted by hunters due to their large size, although included in Appendix I of CITES and classified as Vulnerable by the IUCN. Similar to *Tayassu pecari*, this species rapidly becomes rare in as people newly colonize areas or where the human population exceeds 1 inhabitant/km^2 (Naveda et al. 2008).

Survey methods vary in their effectiveness in recording threatened species, and knowing the best methods to use for particular species is useful for managers responsible for protected areas when planning monitoring activities. Information on the richness, distribution, and conservation status of mammals is lacking in Acre, as well as throughout much of Brazil. Long-term studies are needed to obtain information on the viability of populations of threatened species. We recommend that management plans of protected areas include studies aimed at gathering data on mammal occurrences, which will aid in conservation actions.

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Authors' Contributions

All authors contributed to the preparation of the manuscript.

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